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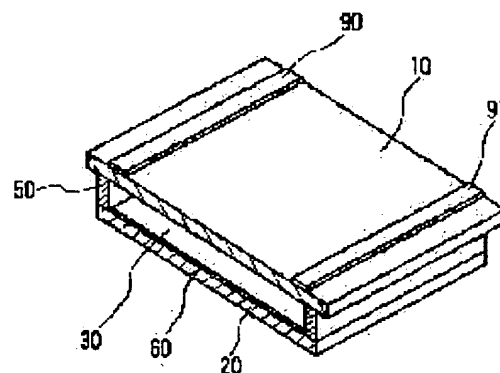
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## (54) FLAT BOARD TYPE SOURCE OF LIGHT AND LIQUID CRYSTAL DISPLAY THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To extend a life, reduce power consumption and make a device safe.

SOLUTION: This liquid crystal display device is provided by sealing a front plate 10, an insulation base board 20, and side boards 50 in one air-tight body, coating the insulation base board 20 with phosphor 60, filling a discharge space 30 with mercury and a starting gas, providing a pair of discharging electrodes 90, 91 parallel to each other on the outside surface of the front plate 10, arranging the discharging electrodes 90, 91 at both end parts of the discharge space 30, and bonding metallic tapes of 5mm in width consisting of aluminum to the front plate 10 as discharging electrodes 90, 91.



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] The plate mold light source characterized by having constituted a well-closed container combining a front board which has translucency, an insulating substrate to which a fluorescent substance was applied, and a side plate, having enclosed discharge gas with the interior of the above-mentioned well-closed container, and forming two or more discharge electrodes in an outside surface of the above-mentioned front board.

[Claim 2] The plate mold light source according to claim 1 characterized by using what consists of a metallic thin plate as the above-mentioned discharge electrode.

[Claim 3] The plate mold light source according to claim 1 characterized by using what consists of a transparency electric conduction film as the above-mentioned discharge electrode.

[Claim 4] The plate mold light source according to claim 1 characterized by using what consists of a transparency electric conduction film and a metallic conductor of the shape of the shape of a stripe which boiled the part at least and was established in piles, and a mesh of the above-mentioned transparency electric conduction film as the above-mentioned discharge electrode.

[Claim 5] The plate mold light source according to claim 1 to 4 characterized by preparing a protective layer in an internal surface of the above-mentioned front board.

[Claim 6] The plate mold light source according to claim 1 to 5 characterized by having formed a spacer in the direction which intersects the above-mentioned discharge electrode, and applying the above-mentioned fluorescent substance to a front face of the above-mentioned insulating substrate and the above-mentioned spacer between the above-mentioned front board and the above-mentioned insulating substrate.

[Claim 7] The plate mold light source according to claim 6 characterized by forming at least one side of the above-mentioned side plate and the above-mentioned spacer on the above-mentioned insulating substrate using thick film printing.

[Claim 8] The plate mold light source according to claim 1 to 7 characterized by covering some above-mentioned discharge electrodes [ at least ] by transparency or white insulator layer.

[Claim 9] A liquid crystal display characterized by using the plate mold light source according to claim 1 to 8.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention is used for the display system which built in OA equipment, such as information visual equipments, such as television which uses display devices, such as a liquid crystal display which needs a back light, a game machine, and a car-navigation system, and a word processor, and the light source, and relates to the plate mold light source and the liquid crystal display which emit light to a plane.

[0002]

[Description of the Prior Art] Although the liquid crystal display is widely used as various kinds of information image displays, such as a personal computer and television, by the thin light weight for the low power, for the display instead of a light emitting device, the back light which supplies light from the back of a liquid crystal panel is required for the liquid crystal itself. Although what combined the narrow diameter fluorescent lamp and the transparent material of acrylic resin is mainly used as this back light, the plate mold electric-discharge lamp is also used.

[0003] Drawing 5 is the cross section showing the conventional plate mold rare-gas electric-discharge lamp indicated by JP,3-225743,A. As shown in drawing, airtight sealing of the front board 10, the insulating substrate 20, and side plate 50 which have the translucency used as a luminescence side is carried out by low melting glass, a well-closed container is constituted, and the rare gas which uses xenon gas as a principal component is enclosed, the interior 30, i.e., the discharge space, of a well-closed container. Moreover, the spacer 40 which consists of a glass bead of a uniform byway between the front board 10 and an insulating substrate 20 distributes, and is arranged, a fluorescent substance 60 is applied to the inner surface of the front board 10 and an insulating substrate 20, and the transparent electrode 70 and the metal membrane electrode 80 are formed in the outside surface of the front board 10 and an insulating substrate 20, respectively.

[0004] In this plate mold rare-gas electric-discharge lamp, if high-frequency voltage is impressed a transparent electrode 70, a metal membrane electrode 80, and in between, in discharge space 30, discharge of rare gas occurs, and a fluorescent substance 60 will be excited by this, light will be emitted, and light will be emitted through a transparent electrode 70.

[0005]

[Problem(s) to be Solved by the Invention] this plate mold rare-gas electric-discharge lamp -- the front board 10 and an insulating substrate 20 -- the transparent electrode 70 and the metal membrane electrode 80 are mostly formed in all outside surfaces, and the fluorescent substance 60 is applied to the front face of the opposite hand of the front board 10 and an insulating substrate 20. For this reason, since charged particles, such as ion, collided with the fluorescent substance 60 at the time of discharge, the fluorescent substance 60 deteriorated, lowering of brightness was intense and there was a problem that a life was short. Moreover, since discharge was generated between the transparent electrode 70 which countered, and the metal membrane electrode 80 and only negative glow produced the mode of discharge, luminous efficiency was bad and the problem that power consumption was large also had it. Furthermore, although the front face of a transparent electrode 70 and a metal membrane electrode 80 needed to be insulated for electrification prevention etc., the transparent electrode 70 and the metal membrane electrode 80 were formed in front reverse side both sides of a electric-discharge lamp, moreover, since the area of a transparent electrode 70 and a metal membrane electrode 80 was large, there was risk of electrification, and there was also a problem on safety.

[0006] It was made in order that this invention might solve an above-mentioned technical problem, and a life is long, power consumption is small, and it aims at offering the safe plate mold light source.

[0007]

[Means for Solving the Problem] In order to attain this object, in this invention, in the plate mold light source, a well-closed container is constituted combining a front board which has translucency used as a luminescence side, an insulating substrate to which a fluorescent substance was applied, and a side plate, discharge gas is enclosed with the interior of the above-mentioned well-closed container, and two or more discharge electrodes are formed in an outside surface of the above-mentioned front board.

[0008] In this case, what consists of a metallic thin plate as the above-mentioned discharge electrode is used.

[0009] Moreover, what consists of a transparence electric conduction film as the above-mentioned discharge electrode is used.

[0010] Moreover, what consists of a transparence electric conduction film and a metallic conductor of the shape of a stripe which boiled the part at least and was established in piles, and a mesh of the above-mentioned transparence electric conduction film as the above-mentioned discharge electrode is used.

[0011] A protective layer is prepared in an internal surface of the above-mentioned front board in these cases.

[0012] In these cases, between the above-mentioned front board and the above-mentioned insulating substrate, a spacer is formed in the direction which intersects the above-mentioned discharge electrode, and the above-mentioned fluorescent substance is applied to a front face of the above-mentioned insulating substrate and the above-mentioned spacer.

[0013] Moreover, at least one side of the above-mentioned side plate and the above-mentioned spacer is formed on the above-mentioned insulating substrate using thick film printing.

[0014] Moreover, some or the whole surface of the above-mentioned discharge electrode is covered by transparence or white insulator layer.

[0015] Moreover, in a liquid crystal display, the above-mentioned plate mold light source is used.

[0016]

[Embodiment of the Invention] drawing 1 shows the plate mold light source concerning this invention -- it is a cutting perspective diagram a

part. As shown in drawing, airtight sealing of the insulating substrate 20 and side plate 50 which consist of the front board 10 and soda glass which consist of soda glass etc., a ceramic, etc. is carried out to one with low melting glass (not shown). A fluorescent substance 60 is applied to the inner surface of an insulating substrate 20. In discharge space 30, as mercury and gas for start up Mixed gas or xenons, such as an argon and a neon-argon, The discharge gas of rare gas, such as a krypton, an argon, helium, and neon, is enclosed, and charged pressure is 100kPa(s) from 10Pa. Moreover, the band-like discharge electrodes 90 and 91 of an parallel couple are mutually formed in the outside surface of the front board 10, discharge electrodes 90 and 91 are located in the both ends of discharge space 30, and discharge electrodes 90 and 91 are formed by pasting up a metal tape with a width of face of 5mm which consists of aluminum on the front board 10. Moreover, discharge space 30 is 110mmx85mm magnitude, and has the luminescence side of about 5.5 inches of vertical angles.

[0017] In this plate mold light source, if the high-frequency voltage (a sine wave, a square wave, or pulse voltage) of 1MHz is impressed to discharge electrodes 90 and 91 from 10kHz, electric-field discharge will be performed in discharge space 30, a fluorescent substance 60 will carry out excitation luminescence by the ultraviolet rays generated in discharge, and light will be emitted through the front board 10.

[0018] In such the plate mold light source, since discharge electrodes 90 and 91 are formed in the same field of the front board 10 and the ion generated in discharge to the fluorescent substance 60 applied to the insulating substrate 20 does not collide directly, deterioration of a fluorescent substance 60 decreases and a life is long. Moreover, by forming discharge electrodes 90 and 91 in the both ends of discharge space 30, since discharge length becomes long, if it is made to discharge, a positive column will be generated. For this reason, since it will mainly be excited with a positive column and luminous efficiency becomes high by high brightness, a fluorescent substance 60 has small power consumption. Moreover, since what is necessary is to form discharge electrodes 90 and 91 only in one side, and just to form discharge electrodes 90 and 91 in the both ends of discharge space 30 moreover, and the area of discharge electrodes 90 and 91 is small and electrification prevention can be performed simply, it is safe. Moreover, since it is prepared by pasting up a metal tape on the outside surface of the front board 10, discharge electrodes 90 and 91 can be manufactured very easily.

[0019] In addition, as a metal thin film, a metallic foil etc. can be used in addition to a metal tape. Moreover, when the discharge electrode which may use what consists of transperance electric conduction films, such as an ITO film and a Nesa membrane, and a thick-film-screen-printing electric conduction film as a discharge electrode, can enlarge area of a luminescence side when the discharge electrode which consists of a transperance electric conduction film is used, and consists of a thick-film-screen-printing electric conduction film is used, it can manufacture very easily. Moreover, when a luminescence side becomes large, a discharge electrode may be prepared not only in a couple but in the middle two or more, or may be divided and used for it. Furthermore, if the internal surface (discharge space 30 side) of the front board 10 is covered by 1000A of thickness numbers of protective layers (not shown) which consist of MgO etc., since operating voltage can be fallen and a spatter can be decreased, a life can be lengthened further.

[0020] Drawing 2 (a) and (b) are drawings showing a part of other plate mold light sources concerning this invention. As shown in drawing, the discharge electrodes 93 and 94 which formed the stripe-like metallic conductor 95 and the mesh-like metallic conductor 96 in piles on the transperance electric conduction films 92, such as an ITO film formed in the outside surface of the front board 10 and a Nesa membrane, are used. Moreover, the terminal 97 for connection with an external circuit is formed in metallic conductors 95 and 96 and one.

[0021] In this plate mold light source, since area of a luminescence side can be enlarged, and the whole surface of discharge electrodes 93 and 94 can moreover be mostly made into this potential by forming metallic conductors 95 and 96 in piles even if resistance of the transperance electric conduction film 92 is high, the homogeneity of discharge can improve regularity of increase and luminescence. Moreover, even if metallic conductors 95 and 96 increase the discharge current in order to obtain high brightness since resistance is dramatically small, the resistance loss of transperance electric conduction film 92 portion does not become a problem.

[0022] drawing 3 shows other plate mold light sources concerning this invention -- it is a cutting perspective diagram a part. As shown in drawing, the spacer 100 is formed in the direction in which the spacer 100 of an abbreviation triangle is formed in the field by the side of the discharge space 30 of an insulating substrate 20, and a cross section intersects a discharge electrode 90 in it. Moreover, the fluorescent substance 60 is applied to the side of a spacer 100 and the front face of an insulating substrate 20 which have countered the front board 10.

[0023] In this plate mold light source, since it is prepared between the front board 10 and the insulating substrate 20, since the interior of discharge space 30 can lose failure of the front board 10 and an insulating substrate 20 with a spacer 100 also in the state of reduced pressure, it can enlarge a luminescence side, and can make thin the front board 10 and an insulating substrate 20, and, as for a spacer 100, can attain lightweight-ization.

[0024] In addition, what is necessary is not to form a spacer 100 over the discharge space 30 whole, and just to form it selectively. Moreover, what is necessary is just to choose configurations which brightness nonuniformity does not produce as much as possible in a luminescence side, such as a configuration which becomes thinner and thinner toward the front board 10 not only at the triangle which also described the configuration of a spacer 100 above but at the shape for example, of a stairway, and the shape of a globular shape and an ellipse. Moreover, that it is together or independently, thick film printing may be used on an insulating substrate 20, a spacer 100 and a side plate 50 may be formed, and both can be manufactured for them in this case very easily.

[0025] Drawing 4 is the cross section showing other plate mold light sources concerning this invention. As shown in drawing, the transparent insulation sheets 110, such as PET (polyethylene terephthalate), have pasted up on discharge electrodes 90 and 91.

[0026] In this plate mold light source, since electrification can be certainly prevented with an insulation sheet 110, it is more safe.

[0027] In addition, the insulation sheet which is an insulator layer may be prepared all over the front board 10, and you may prepare so that some discharge electrodes [ at least ] 90 and 91 may be covered. Moreover, if the white insulation sheet as an insulator layer is used, it can be made to serve as a diffusion sheet. Moreover, the insulating layer formed by thick film printing as well as the insulating film and the discharge electrode as an insulator layer may be used.

[0028] Moreover, the plate mold light source shown in drawing 1 - drawing 4 can be used for the back light of a liquid crystal display.

[0029]

[Effect of the Invention] In the plate mold light source and the liquid crystal display concerning this invention, since the ion generated in discharge to the fluorescent substance applied to the insulating substrate does not collide directly and there is little deterioration of a fluorescent substance, a life is long. Moreover, since discharge length becomes long, since it is mainly excited with a positive column and luminous efficiency becomes high by high brightness, power consumption is small [ a fluorescent substance ]. Moreover, since a discharge electrode is prepared only in one side, it moreover is not necessary to prepare a discharge electrode in the whole surface and the area of a discharge electrode is small, it is safe.

[0030] Moreover, when what consists of a metallic thin plate as a discharge electrode is used, it can manufacture very easily.

[0031] Moreover, when what consists of a transperance electric conduction film as a discharge electrode is used, area of a luminescence side can be enlarged.

[0032] Moreover, since area of a luminescence side can be enlarged and the whole surface of a discharge electrode can moreover be mostly made into this potential when what consists of a transparen electric conduction film and a metallic conductor of the shape of the shape of a stripe which boiled the part at least and was established in piles, and a mesh of a transparen electric conduction film as a discharge electrode is used, the homogeneity of discharge can improve regularity of increase and luminescence.

[0033] Moreover, since operating voltage can be fallen and a spatter can be decreased when a protective layer is prepared in the internal surface of a front board, a life can be lengthened further.

[0034] Moreover, when a spacer is formed in the direction which intersects a discharge electrode and a fluorescent substance is applied to an insulating substrate and the front face of a spacer between a front board and an insulating substrate, since the interior of discharge space can lose failure of a front board and an insulating substrate with a spacer also in the state of reduced pressure, it can enlarge a luminescence side, and can make a front board and an insulating substrate thin, and can attain lightweight-ization.

[0035] Moreover, when at least one side of a side plate and a spacer is formed on an insulating substrate using thick film printing, it can manufacture very easily.

[0036] Moreover, since electrification can be certainly prevented when some or the whole surface of a discharge electrode is covered by transparen or the white insulator layer, it is more safe.

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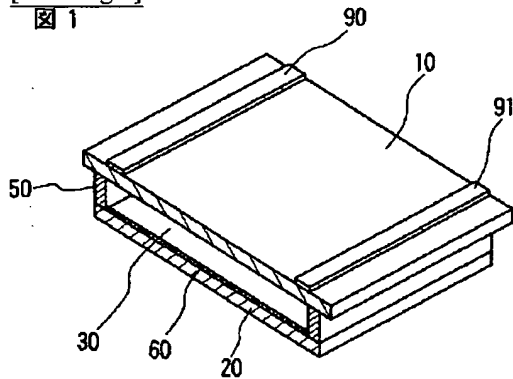
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## DRAWINGS

[Drawing 1]

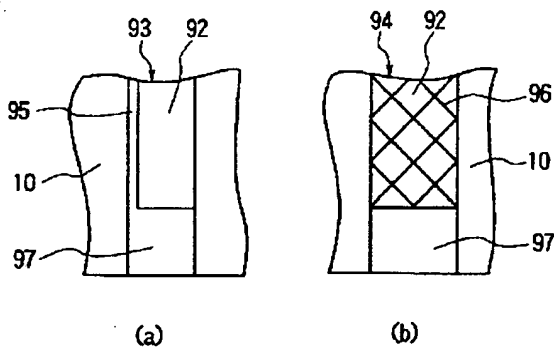
図 1



- 10...前面板  
20...絶縁基板  
50...側板  
60...蛍光体  
90...放電電極  
91...放電電極

[Drawing 2]

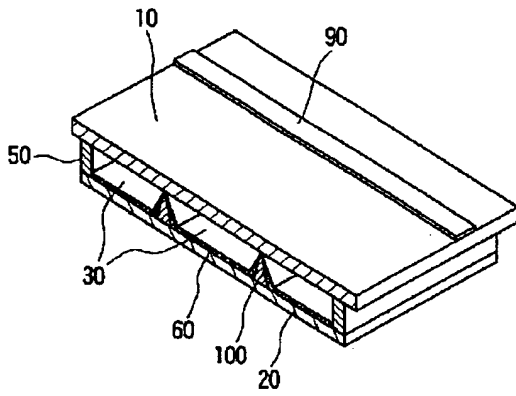
図 2



- 10...前面板  
92...透明導電膜  
93...放電電極  
94...放電電極  
95...金属導体  
96...金属導体

[Drawing 3]

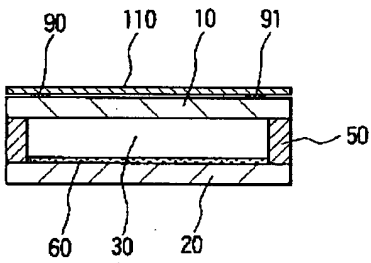
図 3



- 10...前面板
- 20...絶縁基板
- 50...側板
- 60...蛍光体
- 90...放電電極
- 100...スペーサ

[Drawing 4]

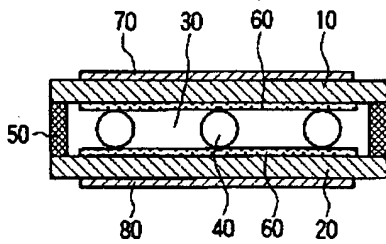
図 4



- 10...前面板
- 20...絶縁基板
- 50...側板
- 60...蛍光体
- 90...放電電極
- 91...放電電極
- 110...絶縁シート

[Drawing 5]

図 5



[Translation done.]